Abstract

The orbits of artificial satellites are very sensitive to a large number of disturbances, whose effects add to the main force exerted by Earth's gravitational field. The most important perturbations, caused by solar radiation pressure, the Moon and the Sun gravitational fields, have been extensively discussed in the literature, and must be taken into account in order to correct the orbital motion, to prevent collisions between satellites in close orbits. In this paper we consider an additional source of acceleration arising from an electric dipole moment induced by the high altitude Earth electric field in a metallic satellite of spherical shape. The order of magnitude of such effect is estimated to be in the range of 10^-23 m/s^2. It is emphasized that the electric dipole moment effect (EDME) is dependent on the satellite shape and geometry and proportional to E_0v/r^4. The Earth electric field E_0 is largely influenced by atmospheric electromagnetic phenomena, such as whistler waves and thunderstorms.

Keywords

Artificial satellite, Electric dipole moment, Earth's electric field.